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ORIGINAL ARTICLE

Pediatrician's cough and cold medication prescription for hypothetical cases – A cross-sectional multi-centric study



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KEYWORDS

Cough and cold medication;
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Abstract *Background:* Concerns over inappropriate use of cough and cold medication (CCM) in children have been raised. In addition to being ineffective, these are now considered toxic for young children. Despite this fact studies from some regions have shown high use of these medications by physicians. However data on pediatricians and from India are negligible. *Aim:* To study the burden and patterns of cough and cold medications use by pediatricians for hypothetical cases. *Methods:* In this cross-sectional study; 172 pediatricians of various hospitals of Delhi and Haryana were enrolled from February 15 to March 15, 2012. They were contacted personally by authors and asked to write their prescriptions for two hypothetical case scenarios [having cough and cold] of two different age groups; (1) less than 2 years and (2) 2–5 years. We made two categories as recommendations exist for children less than 2 years while recommendations for the second category are underway. Results were summarized as percentages, counts and; presented in tables and figures. Chi square test was used to establish association between categorical variables of subgroups. *Results:* Response rate was 93%. The most used CCM was antihistaminics (82%) and systemic sympathomimetics (48%). The use of CCM was significantly less in teaching hospitals as compared to non-teaching

Abbreviations: CCM, cough and cold medication; SI, single ingredient; MI, multiple ingredients; PRZ, promethazine; CPM, chlorpheniramine; PS, pseudoephedrine; PE, phenylephrine; DPH, diphenhydramine; DXT, dextromethorphan; OTC, over the counter; pt., patient; PG, post-graduate

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(77% vs. 95%; p -value = 0.025). However there was no statistical difference in the practice of post graduates and more senior pediatricians (p value=0.895). No difference in CCM use in two age groups {(82% (less than 2 years) vs. 85% (2–5 years); p -value = 0.531} was observed. *Conclusion:* Overall use of CCM is still high irrespective of patient age, pediatrician's seniority or hospital setting. Efforts should be made to create awareness among the pediatricians regarding cautious use of these medications.

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1. Introduction

Cough and cold is the most common cause for hospital visits, and so is the use of cough and cold medication (CCM). A cough and cold medication has been considered to contain a single ingredient (SI) or multiple ingredients (MI) like promethazine (PRZ), chlorpheniramine (CPM), pseudoephedrine (PS), phenylephrine (PE), diphenhydramine (DPH), dextromethorphan (DXT), guanfeneisin and ambroxol. These ingredients have many deleterious side effects like respiratory depression, apnea, seizures, stroke and cerebral hemorrhage as well as cardiac adverse effects like hypertension dysrhythmias and even death. Overuse and potential health hazards of CCM are well recognized. The Centers for Disease Control reported deaths associated with use of pseudoephedrine and dextromethorphan (CDC, 2007). Additionally ten infant deaths associated with use of OTC CCMs were identified in a one year period through review of ACFRP data (Rimsza and Newberry, 2008). These infants were exposed to pseudoephedrine (3 patients {pt.}), chlorpheniramine (2pt.), dextromethorphan (2pt.), promethazine (1pt.) and ambroxol (2pt.). Similarly Marinetti et al. associated the death of 10 infants with ingestion of OTC CCM (Marinetti et al., 2005). Furthermore Wingert et al. linked the death of 13 infants and 2 toddlers with administration of OTC CCM (Wingert et al., 2007). The adverse events are linked to erroneous overdosing and self-medication by parents/caregivers but the exact prescription burden in our country, by pediatricians is not known. Hence this study was done to evaluate and document the current burden of CCM use by pediatricians so that interventions can be formulated to reduce such preventable deaths.

2. Methods

2.1. Study design and setting

This cross-sectional, hypothetical case based study was conducted among pediatricians from February 15 to March 15, 2012. It covered three teaching tertiary care hospitals and two non-teaching hospitals (all government) of Delhi and Haryana. These hospitals have postgraduates (PG) from all over India and senior residents from nearby states like Uttar Pradesh, Bihar, Punjab, Rajasthan, Odisha and West Bengal. Some of them go back to their home towns for practice/work after completing PG and some after completing their residency. Similarly many pediatricians, after their post-graduation in their home town come to Delhi and Haryana for doing residency. In a way their practice should be the representation of north India.

2.2. Sample size and sampling technique

Sample size was calculated using single proportion formula ($n = [Z\alpha/2]^2 p (1 - p)/d^2$) at 95% confidence interval, where, $Z\alpha/2 = 1.96$, p = prevalence of 35% was taken from a previous study from Gujarat (Patel et al., 2013), and $d = 5\%$ of marginal error was taken. Using this calculation we obtained 349 to be the sample size. Since the exact number of respondent population is less than 10,000; we used correction formula of $nf = ni/(1 + ni/N)$ where nf = corrected sample size, ni = uncorrected sample size, and N = total respondents (Thrusfield, 1995). Hence, $(349/1 + 349/250 = 146)$, we obtained a sample size of 146. Additional 15% was added for not responding pediatricians, making a final sample size of 167. The participants were selected using convenience sampling technique. The total sample size was distributed proportionately among the various hospitals. The pediatricians who refused to participate and those with illegible hand writing were excluded from the study.

2.3. Study instrument

The predesigned, self-administered proforma contained two case scenarios of two different age groups; (1) less than 2 years and (2) 2–5 years written separately on proforma. The case scenario was “a child with cough and cold for last two days that is stable and his chest examination is normal” (Annexure 1). The pediatricians were asked to write prescriptions for these two case scenarios. The purpose was to see the difference in pattern of use of CCM as recommendations differ in two age groups. A pretest of proforma was carried out on 10 pediatricians for acceptability and feasibility, who were not included in the study.

2.4. Data collection

Authors (SC, MD and MS) collected the data by contacting 172 pediatricians personally in outpatient and inpatient departments during working hours. Three consecutive days were allotted for a single hospital during the study period. After explaining the purpose of the survey, pediatricians were given the proforma. The proformas were taken back soon after the participants filled it and sealed. These were later opened together for analysis.

2.5. Ethical clearance

The study was approved by institutional review board. Verbal consent of participants was obtained. Confidentiality of the

participants was maintained and their right to withdraw from the survey any time was assured.

2.6. Statistical analysis

Descriptive statistics was used to illustrate responses of the participants. Categorical variables were measured as counts and percentages. Statistical analysis was done using SPSS software. Chi square test was used for calculation of *p* value (significant at <0.05) as the data were categorical. IDR i triple was used to decode the constituents of the CCM products written by pediatricians.

3. Results

Of the 172 pediatricians contacted, 159 (93%) consented to participate. 11 Proformae were excluded due to illegible hand writing making a total 148 for final analysis. Of these, post-graduate students were 30 and rests were seniors (senior residents and assistant professors) as shown in Fig. 1. CCM were used by 82% and 85% pediatricians for less than 2 yrs and 2–5 yrs of age groups respectively and there was statistically significant difference in CCM prescription according to age. 68% pediatricians wrote different CCM for different age categories while 32% used same product for both age groups but differing in dose. Majority of pediatricians used a MI product with a combination of at least two ingredients (48%); three ingredients (27%) and rest used a SI product. Use of MI CCM consisting of PE and CPM was universal in both age groups and all centers except one where 51% pediatricians used a combination of PS and CPM. The use of CTZ was more in babies older than 2 yrs while PRZ and mucolytics were more used in younger babies. Fig. 2 shows the frequency of use of different constituents. The frequency of the most commonly used product (combination of PE + CPM) was QID, TDS, BD and OD in 27%, 68%, 3% and 2% prescriptions respectively. This was similar for PRZ, DPH and CTZ.

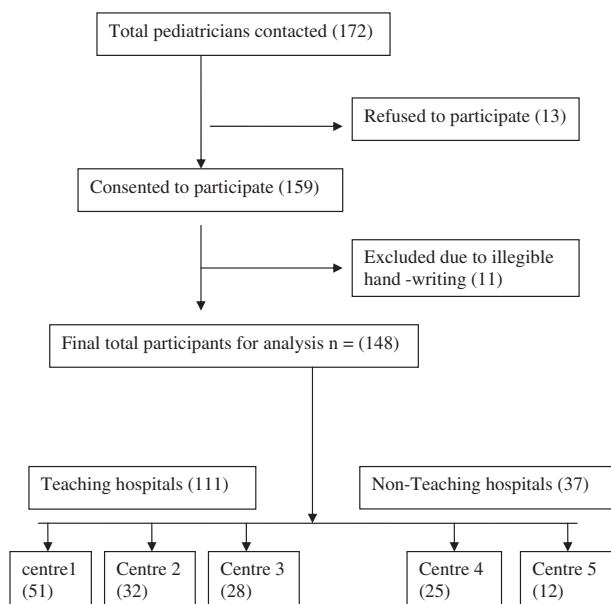


Figure 1 Flow diagram showing distribution of participants in various centers.

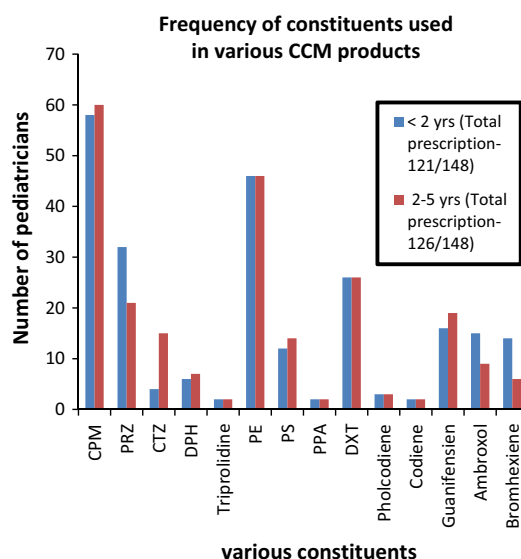


Figure 2 Frequency of constituents used in various CCM products (results are overlapping).

The duration of treatment was 3 days, 5 days and 7 days in 47%, 42% and 11% prescriptions respectively. 33% pediatricians wrote same duration for either age group. Seven percent participants combine two different products containing SI and MI e.g. [(PE/PS + CPM) + DXT] or [(PE/PS + CPM) + ambroxol] or [PE/PS + CPM) + DXT + ambroxol]. All pediatricians wrote brand name of preparations. Only two participants wrote constituents in bracket. None of the pediatrician wrote the concentration of the ingredients. For babies younger than 2 yrs.; 22% pediatricians write medications in drops, 36% pediatricians in (tea spoon full) tsf and 42% pediatricians in ml. Table 1 shows the difference in CCM use among different centers. Center 1 has significantly less CCM usage as compared to others (59%, *p* value 0.001). A significantly less CCM usage was also observed in teaching hospitals as compared to non-teaching (*p* value 0.025). However no difference in CCM use between PG and seniors was found (Table 1).

The results, for which patient age is not mentioned distinctly, are for the 2–5 yrs age group.

4. Discussion

CCM use is still high even after two decades of recognition of their doubtful efficacy and documented toxicity. A recent

Table 1 Difference in CCM use by different categories of pediatricians and patients.

CCM use in	Number of participants	<i>p</i> -value
Teaching center 1 vs Teaching center (2 + 3)	30/51 vs 56/60	0.001
Teaching vs non-teaching hospitals	86/111 vs 35/37	0.025
PG vs Seniors (All Teaching centers)	24/30 vs 62/81	0.895
Patient age < 2 yrs vs 2–5 yrs (all centers)	121/148 vs 126/148	0.531

study from Italy and Netherland has shown that CCM use remains high despite the national warnings against their use (Sen et al., 2011). There is no difference in CCM use according to patient age. Mostly Pediatricians, who refrain from CCM, do not use it for either age group. However differences in choice of CCM in different age group were noticed, the basis of which, is difficult to explain as there are no guidelines suggesting which CCM is to be preferred in a particular age.

MI CCM is prescribed by 75% pediatricians and 7% pediatricians wrote more than one product for a single patient, may be keeping in view the different mechanism of action of constituent drugs for getting maximum possible benefit. But this situation is more dangerous since these constituents alone can cause life threatening events and using 2–3 ingredients would increase the chances of augmentation of toxic effects. Additionally, multiple ingredients in a formulation increase the risk of drug interactions and surely the cost.

Among the systemic decongestants, PE was used by 76% and 20% used PS. Earlier in the Slone survey in U.S., the exposure to PS was highest but now it has decreased because of the 2005 Combat Methamphetamine Epidemic Act, due to which pharmaceutical companies started to replace it by PE (Vernacchio et al., 2008). Potential health hazards and overuse of PS are known, but now in the coming years it will be important to monitor for the toxicities of PE in children.

The use of mucolytics was more in babies younger than 2 yrs. It may be because of the general fact that they are not able to cough out the secretions. Although we had not categorized the case scenarios as having dry/wet cough.

We observed different frequencies for same medication which is not rational. The use of CCM seemed to be hospital specific. Particular types of brands of CCM were used in a particular hospital. This may be because of influence of promotion by medical representatives. Many pediatricians write CCM in tsf which is more prone to dosing errors. Studies show that variations in liquid CCM dosing with spoons can be up to 20%, which can increase the risk of overdosing and adverse events (Wansink and van Ittersum, 2010).

Our results show that CCM use differs among centers significantly depicting more rational approach of one teaching center which resulted in more appropriate practice of teaching hospitals over Nonteaching hospitals (without which there had been no difference between the both settings of hospitals). We can assume them to be more updated than others and those might have adapted to the U.S FDA advice regarding restricted use of CCM (FDA Public Health Advisory, 2013). However there was no difference in practice of PG and seniors. It is usually thought that with more years of professional experience a doctor tends to be a more rational prescriber, but in this study we did not find such association which implies that PGs follow their senior's practice and if seniors could restrict from using CCM by spending more time in counseling the patient, the exposure to CCM would have been very less. Pediatricians should encourage the parents to use non-pharmacological measures for symptomatic relief of cough and cold.

A wide prescription variation shows the lack of uniform guidelines on the topic. The overuse is despite the absence of

any overt policy on their use (Sharfstein et al., 2007). This is very surprising and unfortunate that these medications are considered social and harmless even in the absence of enough evidence of their safety as well as efficacy (Smith et al., 2008; Vassilev et al., 2010). Especially in the absence of efficacy their toxicities should not be accepted. The US and UK has introduced a warning regarding cautious use of these medications in their countries but no such caution has been seen in India. Doyon et al. and Shehab et al. show that CCM-related adverse events among children were substantially reduced after withdrawal of over-the-counter CCM (Doyon et al., 2012; Shehab et al., 2010). This should be taken as enough evidence for promoting nonuse of CCM.

In U.S. the researchers found the use of cough and cold medications declined from 12.3% in 1999–2000 to 8.4% in 2005–2006 (Vernacchio et al., 2008). On the other hand Fatma et al. showed that a warning did not result in decreased prescriptions of CCM (Sen et al., 2011). The pediatricians should make efforts to reduce the CCM use on individual basis.

The strength of the study is a calculated sample size, higher response rate and larger coverage of participants of five hospitals showing generalizability of results. Other studies which conduct surveys through mails or electronic mail have shown response rates of less than 60% which is not considered to be optimum. Higher response rate seen in our study is due to the personal contact to the participants by the authors themselves. Study is good for assessing the current knowledge of pediatricians. In the actual out-patient setting pediatricians may not get time to counsel the patients due to work load. They may be forced to write some medication under parental pressure despite knowing the ineffectiveness of these medications. It is expected that for hypothetical case they will not face such problems and will write evidence based correct prescription. The study has few limitations. The clinicians may not come out with actual practice and CCM use may be much higher. Actual prescription analysis could have been closer to real CCM burden. This study (given the design of the study) has shown most pediatricians are not aware of the toxicities or doubtful effectiveness of CCM due to which the use is high. In a similar observation by Chandelia et al., where actual prescriptions were examined in a single institution, the results were similar (Chandelia and Khanna, 2013). Although we use CCM in the benefit of the patient but we have to recognize that the fatalities associated with CCM cannot be overlooked.

5. Conclusions

Although one center shows significantly less usage, high CCM use persists irrespective of age of patient, seniority of clinician or hospital setting. There is a need to realize and edify our prescriptions regarding the restricted use of these medications. In future studies the causes of higher CCM use should be hit upon.

Appendix A

See Annexure 1.

Annexure 1 (clinical case scenario)

Designation:

Hospital:

1. A child less than 2 years comes to you in OPD with complaints of cough and cold for last two days. He is feeding well. His vitals are stable and chest examination is normal. Write your prescription for this child.

2. A child in age group 2-5 years comes to you with similar presentation as mentioned above. Write your prescription for such a child .

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